JOURNAL
OF THE
BOMBAY NATURAL HISTORY SOCIETY

1966 APRIL Vol. 63 No. 1

Amphiesma platyceps (Blyth) and *Amphiesma sieboldii* (Guenther): sibling species (Reptilia : Serpentes)

BY

EDMOND V. MALNATE

Department of Ichthyology and Herpetology, Academy of Natural Sciences of Philadelphia

(*With 3 figures*)

The Himalayan natricine snake *Amphiesma platyceps* (Blyth) has long been believed to be an extremely variable species. Ninety-six years ago Stoliczka (1870: 191) suggested that variation in the degree of carination of the dorsal scales and in colour pattern were correlated with sexual dimorphism. Boulenger (1890 : 344) made a similar suggestion but, perhaps significantly, made no further reference to the possibility in his CATALOGUE OF SNAKES (1893 : 248). Later authors apparently could find no constancy in such a correlation and were content to describe the variations they found in the species. A study of 55 specimens of *Amphiesma platyceps* from stations throughout the known range of the species has provided data which show that *Amphiesma platyceps* (auct.) is a composite of two very similar, but distinct, sympatric species: *Tropidonotus platyceps* Blyth 1854, and *Tropidonotus sieboldii* Guenther 1860.

DISCUSSION

Amphiesma platyceps and *A. sieboldii* are distinguishable on the basis of two primary characters: (1) the extent and degree of the carination of the dorsal scales; and (2) the number of ventrals. Differences of lesser degree have been observed in several other characters: (3) number of subcaudals; (4) number of infralabials; and, (5) colour pattern; and are suggested in (6) dimensions and proportions; and, (7) distribution.

1. *Carination of the dorsal scales.* The extent and degree of keeling present on the dorsal scales is a strong dichotomous character. Keels are present but weakly developed (sometimes extremely faint) only on five to seven mid-dorsal scale rows in *A. platyceps.* The scales of all dorsal rows are keeled in *A. sieboldii*; the keels are not strongly developed and the first scale row may be smooth (43·8% of the specimens examined). No intermediate condition has been observed; all specimens examined showed either one type of keeling or the other. The characteristic carination of each species is similarly produced in both males and females [ruling out Stoliczka's (loc. cit.) suggestion] and in specimens of varying ages. Geographic variation either in the extent or the degree of carination cannot be demonstrated.

2. *Number of ventrals.* The observed variation in the number of ventrals in *A. platyceps* and *A. sieboldii* is shown in Table I. Among

TABLE I

VARIATION IN THE NUMBER OF VENTRALS IN *Amphiesma platyceps* AND *Amphiesma sieboldii*

	Sex	N	Range of variation	Mean
platyceps	♂	8	205-234	220·8
	♀	13	191-216	202·1
sieboldii	♂	13	191-207	199·2
	♀	13	168-190	182·7

the specimens studied only 7% (4 specimens) could not be assigned to either species on the basis of ventral counts alone; examination of additional specimens very probably will alter this figure. Of special interest is that the sexes of both species are strongly differentiated in the number of ventrals, and that it is the males of each which show the higher counts, a condition contrary to a general tendency among colubrid snakes to produce a greater number of ventrals in females. The geographical distribution of ventral counts, by sex, is shown in

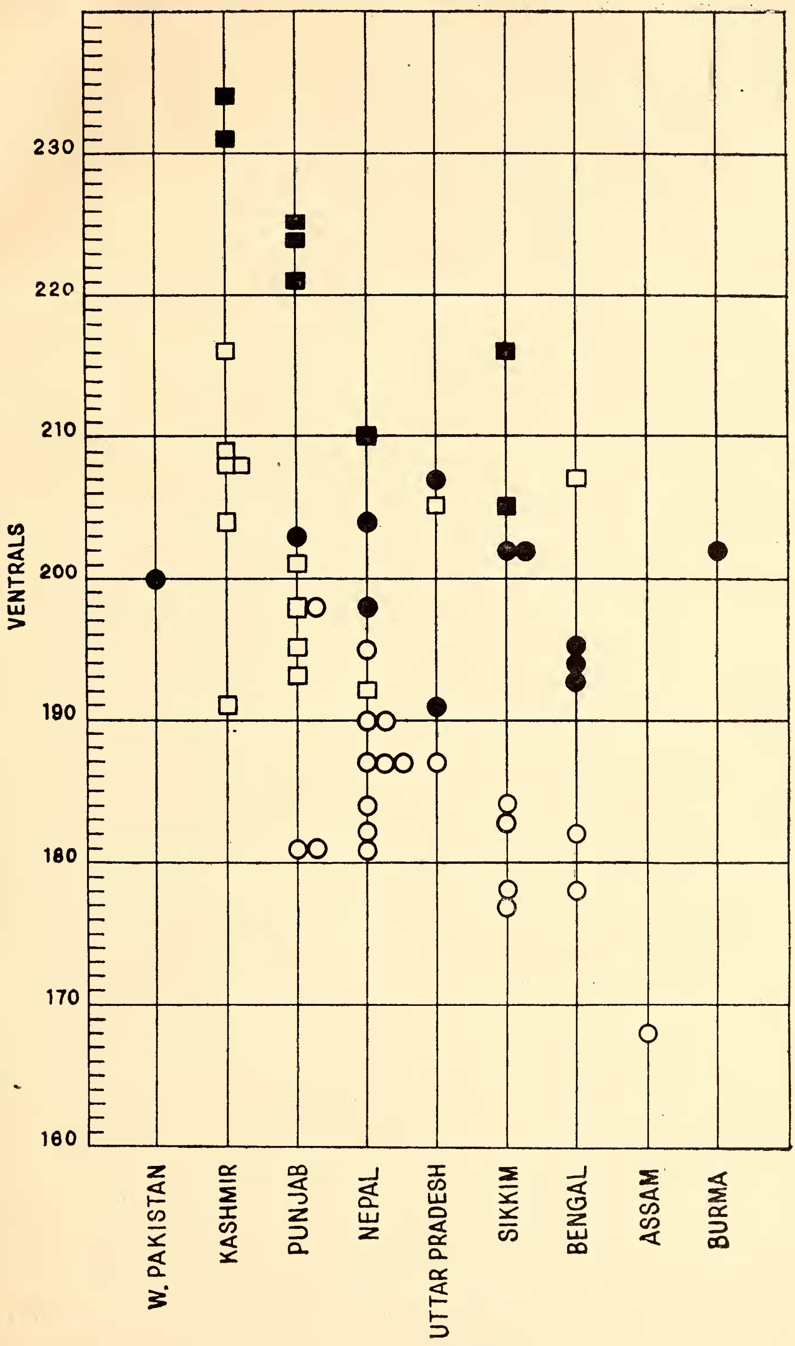

FIG. 1. Geographical distribution of ventral counts of *Amphiesma platyceps* (squares) and *A. sieboldii* (circles). Open symbols represent female counts, solid symbols are male. Specimens from Himachal Pradesh and Punjab are recorded over "Punjab".

Fig. 1. Limited data prevent analysis but variation through the ranges of both species appears, broadly, to be parallel.

The character of the keeling of the dorsal scales and the number of ventrals appear to be correlated and strongly differentiate *platyceps* and *sieboldii.* The characters next noted are not diagnostic but they contribute to the differences between the species.

3. *Number of subcaudals.* Variation in this character in *platyceps* and *sieboldii* is summarized in Table II. Differentiation between the

TABLE II

VARIATION IN THE NUMBER OF SUBCAUDALS IN *Amphiesma platyceps* AND *Amphiesma sieboldii*

	Sex	N	Range of variation	Mean
platyceps	♂	6	88-98	92·2
	♀	11	78-96	86·1
sieboldii	♂	9	97-111	103·7
	♀	14	81-110	95·9

two species in the number of subcaudals, especially in females, is not strong (42% of the specimens with whole tails could not be separated on the basis of this character); the difference is most clearly indicated by the means. Whereas the higher number of ventrals occurs in *platyceps*, it is *sieboldii* which produces the higher number of subcaudals. Male snakes tend to possess a greater number of subcaudals than do females in both species (the anticipated condition). The geographical distribution of subcaudal counts is shown in Fig. 2; analysis is not possible but parallel trends appear in both species. It may be noted that, whereas there is indicated a general east to west increase in the number of ventrals, the number of subcaudals tends to decrease east to west.

The fact that *platyceps* possesses a greater number of ventrals but fewer subcaudals and the reverse condition in *sieboldii* suggest the possibility that a simple shift in the position of the anus is responsible. This may well be true, at least in part, but the data presented in Table III show that *platyceps*, especially the males, tends to develop a greater total number of ventral scutes (ventrals plus subcaudals) than does *sieboldii.*

4. *Number of infralabials.* Analysis of the variation in these scales is presented in Table IV. Because the number of infralabials

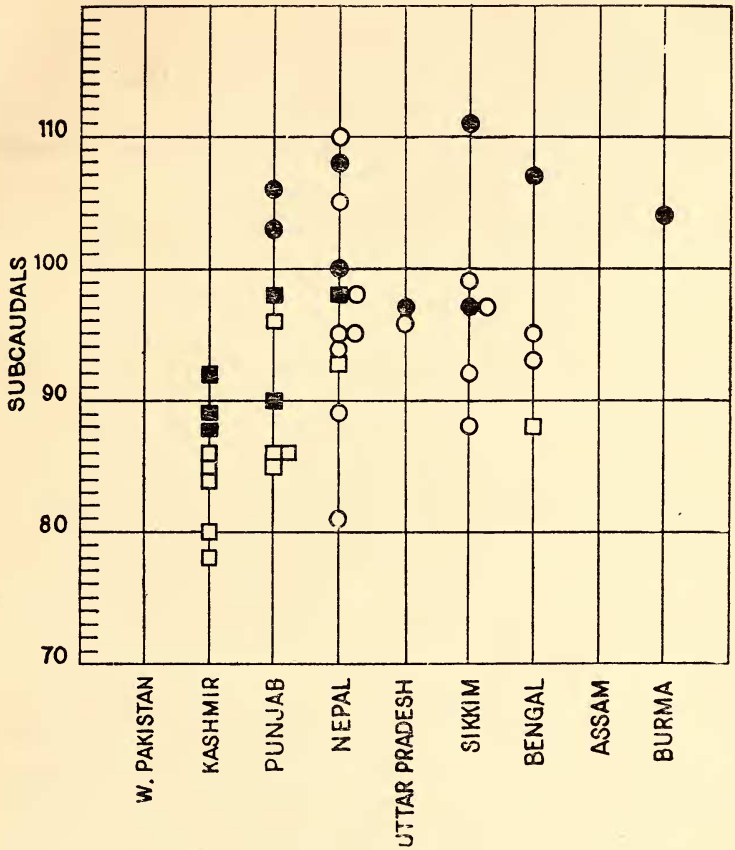

FIG. 2. Geographical distribution of subcaudal counts of *Amphiesma platyceps* and *A. sieboldii.* Symbols as in Fig. 1. Specimens from Himachal Pradesh and Punjab are recorded over "Punjab".

TABLE III

VARIATION IN THE SUM OF VENTRALS PLUS SUBCAUDALS IN *Amphiesma platyceps* AND *Amphiesma sieboldii*

	Sex	N	Range of variation	Mean
platyceps	♂	6	308-326	316·7
	♀	11	271-302	287·3
sieboldii	♂	9	299-313	305·0
	♀	14	266-300	278·3

may differ on each side of the head, counts of each individual series are used (normally two per specimen). A tendency to develop a higher

TABLE IV

VARIATION IN THE NUMBER OF INFRALABIALS IN *Amphiesma platyceps* AND *Amphiesma sieboldii*

No. of infralabials	*platyceps* No. of counts	*platyceps* % of total counts	*sieboldii* No. of counts	*sieboldii* % of total counts
8	5	12·8	(mean = 9·8)	
9	22	56·4	12	21·4
10	12	30·8	43	76·8
11	(mean = 9·2)		1	1·8

number of infralabials is evident in *platyceps*, 30·8% of the counts being 10. In *sieboldii*, however, 10 or more infralabials are common, occurring in 78·6% of the counts. Geographic variation in this character is not evident in the data at hand.

5. *Colour pattern.*

HEAD. The nuchal crescent (a pattern element produced from the last supralabial and extending upwards and backwards over the nape) of *platyceps* commonly is a simple, dorsoposterior extension of the dark postocular streak which borders the upper edge of the supralabials; the light colour of the supralabials and the dark of the lip edge are rarely included. The nuchal pattern of *sieboldii*, on the other hand, may be fully developed as a light, dark-bordered crescent extending from the last supralabial up and back over the nape and, sometimes, produced posteriorly on the neck for a short distance as parallel stripes. Occasionally, the crescent is broken into 3 or 4 light, dark-edged spots.

DORSUM. The dorsum of both species is more or less uniform; *platyceps*, however, is more frequently marked with small dark spots than is *sieboldii*. A dorsolateral series of small light spots is rarely evident on *platyceps*, and when present the spots are weakly defined. These spots are commonly present on *sieboldii*, obscure posteriorly on the body but more prominent anteriorly.

VENTRUM. It is on the ventrum that the major pattern difference between the species appears. The ventral surface of *platyceps* usually is immaculate; a lateral series of dark streaks may be present, these either obscure or sharply defined. The subcaudal surface, usually immaculate, occasionally is darkened with grey or, rarely, shows dark stippling along the common, median sutures of the plates.

In *sieboldii* the ventrum rarely is immaculate; often it is darkened posteriorly with a greyish suffusion of variable intensity, and occasional, discrete, dark spotting also may be present. A lateral series of dark streaks usually is present, more prominent posteriorly on the belly. The subcaudal surface is rarely light or immaculate. Commonly, a lateral series of dark spots (a continuation of the ventral series) is present and the median, common sutures of the subcaudals are darkened. Occasionally the entire subcaudal surface is dark. Among the specimens of *sieboldii* examined 50% have the chin and throat darkened with a tone which varies from grey to dark brown or black. The darkened area may be confined to the scales of the chin or extend posteriorly to the level of the 20th ventral.

6. *Dimensions and proportions.* The tail of *sieboldii* is proportionately somewhat longer than that of *platyceps*, perhaps in association with the greater number of subcaudals in that species; this is shown in Table V.

TABLE V

TAIL/TOTAL LENGTH RATIO IN *Amphiesma platyceps* AND *Amphiesma sieboldii*

	Sex	N	Range of variation	Mean
platyceps	♂	5	0·243-0·267	0·2520
	♀	10	0·232-0·273	0·2478
sieboldii	♂	8	0·261-0·295	0·2769
	♀	14	0·242-0·300	0·2759

Reduction in the number of dorsal scale rows from 19 to 17 is, in both species, accomplished by the loss of the fourth scale row. This scale row is present for a greater percentage of the head and body length in *sieboldii* (Table VI).

7. *Distribution.* *Amphiesma platyceps* is known, on the basis of the specimens examined, to be distributed from Darjeeling, Bengal, west to Kashmir, at altitudes ranging from 6000 to 10,000 feet (Fig. 3). *A. sieboldii* is known from Taung-gyi, Burma (see p. 15 below), to

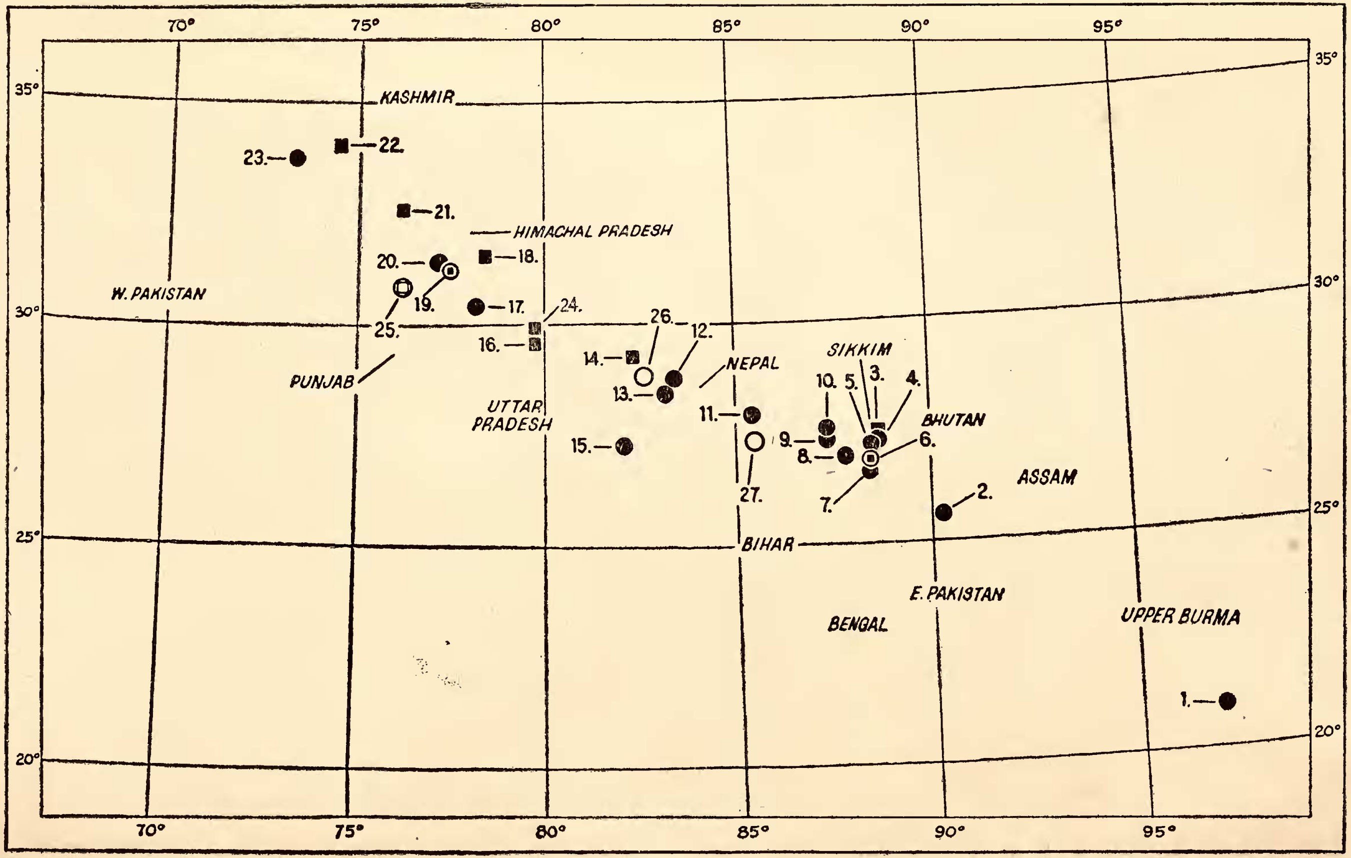

FIG. 3. The distribution of *Amphiesma platyceps*, squares, and *A. sieboldii*, circles. Numerals refer to localities cited in the text (specimens examined). Thundiani (25), Punjab, and Amp pipal (27), Nepal, cannot be located with certainty.

Ghora Galli, West Pakistan; thus, it is sympatric with *platyceps* through most of its range but shows an eastward extension. The known altitudinal distribution of *sieboldii*, 4000 to 12,000 feet, is broader than that

TABLE VI

LENGTH OF 4TH SCALE ROW, AS A PERCENTAGE OF THE HEAD AND BODY LENGTH IN *Amphiesma platyceps* AND *Amphiesma sieboldii*

	Sex	N	Range of variation	Mean
platyceps	♂	4	56·5%-59·5%	57·83%
	♀	7	55·3%-64·8%	58·87%
sieboldii	♂	6	56·5%-61·2%	59·07%
	♀	9	52·8%-64·0%	60·18%

of *platyceps*. Both species have been taken at three stations: Darjeeling, Bengal, Simla, Himachal Pradesh, and Thundiani, Punjab.

The differentiation of *Amphiesma platyceps* and *A. sieboldii*, as observed in the present study, may be summarized thus: (1) in *platyceps* only the scales of the mid-dorsal rows are keeled, and these faintly so; in *sieboldii* all scale rows except, occasionally, the outer row are keeled; (2) *platyceps* has a greater number of ventrals; but, (3) fewer subcaudals; (4) the number of infralabials is most frequently 9 in *platyceps*, 10 in *sieboldii*; (5) slight pattern differences between the species appear on the head and dorsum; the ventral pattern, of the two species, however, is more strongly differentiated, that of *platyceps* normally being immaculate whereas the ventrum of *sieboldii* is rarely so; (6) *platyceps* appears to have a proportionately shorter tail, and a reduction in the length of the fourth scale row; (7) *platyceps* is not known further east than Sikkim, *sieboldii* ranges into Assam and eastern Burma.

The two species are notably similar or identical in the following variable characters:

a. Oculars (1 pre-, and 3, often 2, postoculars)

b. Temporals (usually a single anterior temporal, sometimes 2; posterior temporals commonly single, frequently 2, very rarely increased to 3 in *platyceps*)

c. Supralabials (8, the 3rd to 5th border the orbit)

d. Apical scale pits (not observed on most specimens examined; they may be faintly evident, however, on the scales of the neck)

e. Head length/width ratio (1·7 to 2·6, mean 2·0, 43 specimens)

f. Length of snout (28% to 35% of the head length, mean 31·8%, 18 males; 26% to 35%, mean 28·2%, 25 females)
g. Eye diameter (14% to 21% of the head length, mean 18·2%, 18 males; 14% to 21%, mean 16·1%, 26 females)
h. Maxillary dentition (teeth usually in continuous series in *platyceps*, the posterior two, enlarged teeth sometimes separated from the anterior series; posterior enlarged teeth commonly separated from anterior series in *sieboldii*)
i. Hemipenes (organ simple in both species but usually is bilobate at the tip in *sieboldii*; the single, enlarged basal spine present in both species is, in *sieboldii*, commonly followed distally by a cluster of stout spines; both characteristics are rarely present in *platyceps*)
j. Secondary sexual characters [among males of both species greater than 528 mm. in total length, the scales of the cloacal region are more strongly keeled and the keels are knobbed (tuberculate); females of both species, 490 mm. and larger in total length, may possess tubercles on the dorsal head shields].

It is evident that two forms have, indeed, been confused under the name *Amphiesma platyceps* (auct.). In spite of the great similarity of the two forms the correlation of carination of the dorsal scales and the number of ventrals readily separate them. The differentiation in these characters plus the lesser differences observed are believed to indicate the presence of two distinct species and not a single, dimorphic species in which one form possesses keels on all scale rows, the other having the keeling confined to the vertebral rows. Both forms are sympatric over most of their ranges and are not presently known to have ecological separation (future field work may show ecological divergence), yet none of the specimens examined could be determined to be intermediate; reproductive isolation is, therefore, assumed.

Mayr (1963: 34) defines sibling species as 'morphologically similar or identical natural populations that are reproductively isolated'. Such a definition applies to *Amphiesma platyceps* and *sieboldii*. Mayr further states (op. cit.: 57) that 'geographic speciation is the normal process by which sibling species originate'. It is impossible, within the present limits of our knowledge, to determine previous geographic isolation for *platyceps* and *sieboldii*. Three factors observed in the study, however, may have some relevance: (1) the eastward extension of *sieboldii* into Assam and Upper Burma to the exclusion of *platyceps*; (2) the broader altitudinal range of *sieboldii* (4000 to 12,000 feet; 6000 to 10,000 feet for *platyceps*); and, (3) the apparently parallel clinal trends in the numbers of ventrals and subcaudals in both species. Differentiation in geographic isolation is not necessarily supported by these data but they may be interpreted as indicating the possibility of two, separate, dispersals from an eastern centre. Both species appear to be related to a complex of species of *Amphiesma* (*modesta*, *et al.*), centred in the region at the eastern end of the Himalayas. The interrelationships of the species of this complex are, unfortunately, confused and confusing. A discussion of the possible derivation of *platyceps* and *sieboldii* from one or more of the species associated with *modesta* must be deferred until such time as the group is more clearly understood.

Redescription of the species

It is believed pertinent here to briefly redescribe *Amphiesma platyceps* and *A. sieboldii*; data presented in Tables I-VI are not repeated in the descriptions. The disposition of the specimens examined in the course of the study is included under each species.

Amphiesma platyceps (Blyth)

Tropidonotus platyceps Blyth, 1854, Journ. Asiatic Soc. Bengal **23** (3): 297 [type: Indian Museum (Calcutta), ZSI Reg. No. 7482; type locality: Darjeeling, Bengal]

Zamenis himalayanus Steindachner, 1867, Verh. Zool.-bot. Gesell. Wien **17**: 513, pl. 13 (types Natur. Mus. Wien, Nos. 18569, 18570: 1-2; type locality: Simla and Kulu, Himachal Pradesh, India)

It is impossible to give a complete synonymy inasmuch as both *platyceps* and *sieboldii* are included in the comments of most authors. For the same reason distribution records in the literature are not considered.

Blyth's original description (loc. cit.) mentions five specimens. Two from Assam, one with ' 155 scutae only ' and a ' small young example ', appear to be representative of *Amphiesma parallela.* A third specimen ' remarkable for having the chin and throat quite black ' evidently represents *sieboldii.* Thus, Blyth's description is a complex characterization of three species. Dr. B. Biswas, Superintending Zoologist, Zoological Survey of India, informs me (*in litt.*) that only one specimen of the original series, ZSI 7482, remains. This individual agrees best with the largest example Blyth had before him and upon which his description is essentially based. To this specimen may be applied Blyth's name *platyceps*. The specimen is described as having only the 3 or 4 vertebral rows weakly keeled, the lateral rows being smooth; the ventrals number 183 (a lower count than any personally observed), the subcaudals 93 (?), the tip of the tail being broken; the total length is 692+ mm., the tail 195+ mm.; the belly is white and no pattern is visible on the chin (Dr. Biswas, *in litt.*). Blyth describes traces of greenish-dusky on the throat ; these marks evidently have faded.

Steindachner's (loc. cit.) nominal form *himalayanus* almost certainly belongs here. Through the courtesy of J. Eiselt, Natur. Mus., Wien, I have been permitted to examine Stoliczka's specimens, upon which Steindachner based his name. The three specimens (NMW 18569, 18570:1-2) are all females with faint keels present on the vertebral 5 to 7 scale rows only. Ventral and subcaudal counts are 200+63, 201+83, and 205+92, respectively. These data leave no doubt that *himalayanus* is a synonym of *platyceps*.

Description of the species. Rostral wider than high, narrowly visible from above. Internasals as wide as long, internasorostral contact 1 or slightly less than 1. Prefrontals wider than long, longer than the internasals. Frontal longer than its distance from the tip of the snout, equal in length to the interparietal suture. Parietals shorter than their combined width. Nasal divided completely or below the nostril only. Loreal longer than high. Preoculars single ; postoculars 3, often 2. Anterior temporals single, occasionally paired ; posterior temporals usually single, very often 2 (one count of 3). Supralabials 8 (one count of 7), 3rd to 5th border the orbit. Posterior chin-shields the longer pair, separated ½ to their entire length by small scales.

Dorsal scales in 19-19-17 rows, the 3 to 7 vertebral rows only are faintly keeled, all other rows being smooth ; apical scale pits not usually evident but they may be present, obscurely, on the neck.

Head light brown above, sometimes mottled or marbled with dark brown, especially on the parietals ; paired, light occipital spots and a postparietal light streak may be present. Supralabials light, bordered above with a dark brown or black stripe from the rostral to the eye (sometimes lacking) and from the eye to the commissure of the mouth (may be greatly reduced but usually is present). Nuchal crescent often reduced to a single dark streak from the angle of the jaw up and back across the nape ; rarely includes a light stripe or light spots. Dorsum brown or olive-brown (olive-green in life, auct.) ; small, dark brown spots commonly present, these most prominent and regularly arranged in a vertebral series with a dorsolateral series less evident and irregular ; both series usually are more prominent anteriorly on the body ; a dorsolateral series of light spots is rarely evident. Ventrum usually immaculate, a lateral series of dark streaks may be present, especially posteriorly but are weakly defined ; a speckling of tiny dark spots may occur posteriorly (over the entire ventral surface, except the anal plate, on one specimen) ; lateral edges of the ventrals are red in life (auct.) ; subcaudal surface usually immaculate, sometimes more or less peppered with dark spots, rarely the median sutures of the subcaudals are darkened; chin greyish on one specimen, the gular scales finally edged dark on another.

Maximum observed total length: male, 676+ mm.; female, 927 mm. Head length/width ratio: 1·7 to 2·4, mean 2·1, 18 specimens. Snout (as a percentage of the head length): 29% to 33%, mean 31·3%, 7 males; 29% to 35%, mean 31.0%, 9 females. Diameter of eye (as a percentage of the head length): 15% to 21%, mean 18.8%, 7 males; 14% to 19%, mean 16·0%, 11 females.

Maxillary teeth 18 to 22; the anterior series of 16 to 20 gradually increase in size posteriorly and are followed by two strongly and abruptly enlarged teeth which sometimes are separated from the anterior series by a slight interspace (15 maxilla examined).

Hemipenes extend to the level of the 8th to 10th subcaudals; the organs are simple, rarely bilobate, spinous throughout, the spines small; one enlarged basal spine present, rarely followed by a cluster of stout spines. Sulcus spermaticus single, extending to the organ tip. (Description based on the hemipenes of 6 males.)

Distribution. Darjeeling, Bengal, in the east, to Gulmarg, Kashmir, in the west, at recorded altitudes of 6000 feet (Dalhousie, Himachal Pradesh) to 10,000 feet (unspecified locality in Kashmir).

Natural history. The stomachs of specimens examined contained only *Leiolepisma himalayanum*. Curiously, three of the four snakes having fed on this lizard had swallowed their prey tail first! One *A. platyceps* contained eight adult and four juvenile specimens of *L. himalayanum*. An ingested *L. himalayanum* contained three well-developed embryos. A female *A. platyceps*, 717 mm. in total length, contained two large (25×8 mm.) eggs.

Specimens examined: (Numerals in parentheses following each locality refer to locations on map.) NEPAL: Jumla (14), 7600 feet (BM 1953. 1. 1. 63), no specific locality (BM 45. 1. 12. 570); INDIA: Sikkim, Mangpu (3), (CNHM 15827), no specific locality (BM 60.3.19.1354); Bengal, Turjun tea estate, Darjeeling (6), (BNHS 80-11); Uttar Pradesh, Almora (16), (BNHS 80-3), Binsar (24), (BM 1911.9.8.2); Punjab, Thundiani (25), (BNHS 580); Himachal Pradesh, Dalhousie (21), 6000 feet (BNHS 80-2), Simla (19), (BNHS 80-5 (b), 80-7), Upper Sutlej Valley (18), 7000 feet (BM 1911.5.9.1); Kashmir, Gulmarg (22), (BM 96.11.20.5-6), no specific locality (BM 70.11.30.36A-D, 10,000 feet; BM 1903.6.22.23; USNM 48469-70).

Amphiesma sieboldii (Guenther)

Herpetoreas sieboldii Guenther, 1860, Proc. Zool. Soc. London: 156 (type: British Museum, 1946.1.13.16; type locality: Sikkim, 7500 feet); 1864, Reptiles British India: 257)

Tropidonotus chrysargus Wall, 1907, Rec. Ind. Mus. 1 (2): 156 (*non* Schlegel; this is Wall's first recording of the two specimens later described as *firthi*).

Tropidonotus firthi Wall, 1914, Journ. Bombay nat. Hist. Soc. 23 (1): 166 (types: Indian Museum (Calcutta), ZSI Reg. No. 15817-18; type locality: Chitlang, Nepal).

Natrix firthi Shaw, *et al.*, 1939, Journ. Darjeeling nat. Hist. Soc. 13 (4): 150.

Guenther's original description of *sieboldii* (loc. cit.), upon which species Guenther based the monotypic genus *Herpetoreas*, was prepared from a single specimen. Guenther variously describes the dorsal scales as 'keeled', or 'those of the back slightly keeled'. Miss Alice G. C. Grandison, after examination of the type, informs me (*in litt.*) that all but the outer row of scales bear faint but distinct keels. Miss Grandison further describes the type as a male, with 211 ventrals (a slightly higher number than any personally observed) and 89 subcaudals. There seems to be little doubt that Guenther had before him a specimen of the species here reported as distinct from *platyceps* and that the name proposed by Guenther, *sieboldii*, must be assigned to it.

Wall's original description of *firthi* (loc. cit.) clearly associates his species with that of Guenther. Dr. Biswas (*in litt.*) has verified the salient characteristics upon examination of the cotypes in the Indian Museum. Dr. Biswas also informs me that the disposition of a third specimen (from Takdah, Darjeeling District, Bengal), included by Wall in his original description, is unknown.

Description of the species. Rostral wider than high, narrowly visible from above. Internasals longer than wide, internasorostral contact 1 or slightly less than 1. Prefrontals wider than long, longer than the internasals. Frontal slightly longer than its distance from the tip of the snout, equal to the length of the interparietal suture. Parietals shorter than their combined width. Nasal completely divided (sometimes below the nostril only). Loreal longer than high. Preoculars single, rarely divided; postoculars 3, occasionally 2. Anterior temporals most commonly single, often paired; posterior temporals usually single, often 2. Supralabials invariably 8; 3rd to 5th border the orbit. Posterior chin-shields the longer pair, separated from ½ to their entire length by small scales.

Dorsal scales in 19-19-17 rows, lightly keeled, outer row often smooth; apical scale pits not usually evident but may be present, obscurely, on the neck; to approximately mid-body on the type (A.G.C. Grandison, *in litt.*).

Head brown above, lighter laterally; paired, light occipital spots and a postparietal light streak usually present. Supralabials light, bordered above with a dark brown or black stripe, from the rostral to the eye, and from the eye to the commissure of the mouth; lid edge also may be dark, especially posterior to the eye. The pattern of the supralabials continues up and back over the nape as a nuchal crescent, and, in an occasional specimen, continues posteriorly on the neck for a short distance; the nuchal crescent may be reduced (or absent) or broken into a series of 3 or 4 light, dark-edged spots. Dorsum more or less uniform (olive-green in life, auct.), lighter laterally; scales frequently dark-edged; a vertebral series of irregular, transverse, blackish crossbars sometimes is present; a dorsolateral series of small, light spots may be present, these generally obscure but sometimes are more prominent posteriorly on the body. Ventrum light, a lateral series of dark, elongate spots is usually present; rarely an overall suffusion of grey appears; area lateral to the series of black spots is reddish in life (auct.); scattered black stippling sometimes present or the stippling is concentrated medially on the posterior portion of the venter; chin and throat often darkened with a greyish to black pigmentation which may extend posteriorly as far as the 20th ventral; subcaudal surface with lateral dark spots and a dark edging to the common, median sutures of the plates, or sometimes the undertail is totally suffused with dark grey.

Maximum observed total length: male, 729 mm.; female, 943 mm. Head length/width ratio: 1·7 to 2·6, mean 2·0, 25 specimens. Snout as a percentage of the head length): 28% to 35%, mean 32·1%, 11 males; 26% to 33%, mean 30·5%, 14 females. Diameter of eye (as a percentage of the head length): 14% to 21%, mean 17·9%, 11 males; 14% to 21%, mean 16·2%, 15 females.

Maxillary teeth 17 to 21 + 2; the teeth of the anterior series gradually increase in size posteriorly, and are separated by a slight diastema from the two, strongly enlarged posterior teeth (17 maxilla examined).

Hemipenes extend to the level of the 7th to 10th subcaudals; the organs are simple, usually bilobate at the tip, spinous throughout, the spines small; a single enlarged basal hook is followed immediately distad by a group of 3 or 4 stout spines (these rarely absent). Sulcus spermaticus single, extending to the tip of the organs. (Description based on the hemipenes of 9 males.)

Distribution. Taung-gyi, Upper Burma, in the east, to Ghora Galli, West Pakistan, in the west, at known altitudes varying from 4000 feet (Amp pipal, Gorkha district, Nepal) to 12,000 feet (Balangra Pass, Nepal). Wall (1923:604), without comment, states that the record from Taung-gyi is ' untrustworthy '. The specimen (BNHS 80.4) is unquestionably *sieboldii*. Taung-gyi, approximately 500 miles south-east of the Garo Hills, Assam, is on the Shan Plateau of eastern Burma; surrounding altitudes vary from 5000 to 8000 feet. The Shan Plateau is associated with the complex of low mountains radiating from the eastern end of the Himalayas (including the Garo and Khasi hills). The penetration of the Shan Plateau by *sieboldii* may have some association with the broader altitudinal range recorded for the species. Although the appearance of *A. sieboldii* on the Shan Plateau is believed valid it seems best to retain Wall's question until the record is verified.

Natural history. Stomach contents of specimens examined included unidentified frogs, tadpoles, frog eggs, and partially digested *Lygosoma indicum indicum.* A female *A. sieboldii,* 435 mm. in total length, contained five, small, undeveloped eggs.

Specimens examined. (Numerals in parentheses following each locality refer to locations on map.) BURMA: Shan States, Taung-gyi (1), (BNHS 80.4); NEPAL: Amp pipal (27), 4000 feet (CNHM 109762), Balangra Pass (26), 12,000 feet (BM 1953.1.1.64), Hatia (10), Arun River, 6500 feet (BM 1962.1047), Lumsum (13), 22 m. NW. Beni, 6500 feet (BM 1955. 1. 13. 71), Maikola Valley (8), 7000-10,000 feet (BM 1913. 5. 22. 1), Maewa khola, Sangwe (9), 6500 feet (BM 1962.1048), Taglung (12), 5 m. S. Tukucha, 9500 feet (BM 1955. 1. 13. 69-70), Thangjet (11), 5000 feet (BM 1950. 1. 5. 59-60), no specific locality (BM 45. 1. 12. 572); SIKKIM: Gangtok (4), (BNHS 80-10); INDIA: Assam, Garo Hills, Tura (2), (BNHS 80–8); Bengal, Darjeeling (6), (BM 70.11.30.37M-N), Lebong (5), (BNHS 1835), no specific locality (BNHS 80-15, BM 53. 8. 12. 30K-L, BM 60. 3. 19. 1352); Takdah (7), (MCZ 58238-40); Uttar Pradesh, Gonda (15), (BNHS 80-9), Mussoorie (17), 6000-7000 feet (BM 1905. 10. 27. 1, UMMZ 77237); Punjab, Thundiani (25), (BNHS 581); Himachal Pradesh, Simla (19), (BNHS 582, 80-5a), Taradevi hill (20), near Simla (BNHS 80-6); WEST PAKISTAN: Rawalpindi, Ghora Galli (23), (BNHS 80-14).

ACKNOWLEDGEMENTS

A number of people have assisted in various ways in the course of this study. Humayun Abdulali, then Honorary Secretary, Bombay Natural History Society, and Miss Alice G. C. Grandison, British Museum (Natural History), graciously arranged the loan of the specimens which formed the basis of the study. The opportunity to examine additional specimens has been afforded by: Robert F. Inger, Chicago Natural History Museum; J. Eiselt, Naturhistorisches Museum, Wien; Ernest E. Williams, Museum of Comparative Zoology, Harvard University; the late Norman Hartweg, Museum of Zoology, University of Michigan; and Doris M. Cochran, United States National Museum. B. Biswas, Zoological Survey of India, Indian Museum, Calcutta, and Miss Grandison have been most generous in supplying data concerning the types of *platyceps* and *firthi*, and *sieboldii*, respectively. James Böhlke, Academy of Natural Sciences, Philadelphia, reviewed the manuscript and offered valued criticisms. Miss Katherine Fisler, Franklin College, aided in translation from the German. Mrs. Judith Silver, Academy of Natural Sciences, has been an invaluable secretary and library assistant. To all these friends and colleagues I extend my sincere appreciation for their aid.

References

BLYTH, EDWARD (1854): Notices and descriptions of various reptiles, new or little known. *Journ. Asiat. Soc. Bengal* **23** (3): 287-302.

BOULENGER, G. A. (1890): The Fauna of British India, including Ceylon and Burma. Reptilia and Batrachia. London, xviii+541 pp., 142 figs.

——— (1893): Catalogue of the snakes in the British Museum (Natural History) **1**. London, xiii + 448 pp., 26 figs., 28 pls.

GUENTHER, A. (1860): Contributions to a knowledge of the reptiles of the Himalaya mountains. *Proc. Zool. Soc. London*: 148-175, pls. 25-28.

——— (1864): The reptiles of British India. London, xxvii+452 pp., 26 pls.

MAYR, ERNST (1963): Animal species and evolution. Cambridge (Mass.) xiv+ 797 pp., 65 figs.

SHAW, G. E., SHEBBEARE, E. O., & BARKER, P. E. (1939): The snakes of northern Bengal and Sikkim. V. *J. Darjeeling nat. Hist. Soc.* **13** (4): 150-159.

STEINDACHNER, FRANZ (1867): Ueber dreineue Schlangen arten. *Verh. Zool.-bot. Gesell. in Wien* **17**: 513-516, pl. 13.

STOLICZKA, F. (1870): Observations on some Indian and Malayan Amphibia and Reptilia. *Journ. Asiat. Soc. Bengal* **39** (2): 134-223, pls. 9-12.

WALL, F. (1907): Ophidia, in Reports of a collection of Batrachia, reptiles and fish from Nepal and the western Himalayas. *Rec. Ind. Mus.* **1** (2): 149-158, pl. 6.

——— (1914): A new snake of the genus *Tropidonotus* from the eastern Himalayas. *J. Bombay nat. Hist. Soc.* **23** (1): 166-167.

——— (1923): A hand-list of snakes of the Indian Empire. Pt. 2. *J. Bombay nat. Hist. Soc.* **29** (3): 598-632.